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PAYBACK ASSESSMENT OF ALTERNATIVE SYSTEM OF ELECTRICAL POWER TRANSMISSION IN GOLIATH CRANE

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Abstract :-

Transmission tower manufacturing industry is engaged in the design, development, manufacturing, supply and construction of overhead transmission lines for Turnkey projects including manufacture of substation structures microwave tower and similar structure. There are different types of cranes used in transmission tower company Such as goliath crane, EOT crane and mobile crane to transfer raw materials ,semi-finish and finish products from one place to another place. The installation of goliath cranes are in raw and dispatch yard and it is used to transfer raw materials from raw yard to different machine in fabrication shop also it transfer finish good from dispatch yard to different transport vehicles like container, trailor or truck etc. Draw back in the existing system of goliath crane means high breakdown occurs due to damages of supply current trolley cable therefore high maintenance and production cost is involved and after every two years supply current trolley cable is replaced by new one. In this investigation a complete though is given as regards how to minimize breakdown and production loss by implementing bus-bar system in place of existing system of goliath crane .Bus-bar system is used to supply 3-phase current to different motors of goliath crane instead of cable trolley system .A typical arrangements are depicted in this paper.

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This paper presents evolving a payback assessment of alternative system of electrical power transmission in goliath crane for transmission tower manufacturing company.

Keywords: Transmission Tower Company, goliath crane, cable trolley system, bus-bar system.

I. Present Status Of Operation : -

Following are the different types of crane used in transmission tower company to transfer materials from one station to another station.

1. Goliath Crane.
2. EOT Crane (Electrical Overhead Travelling)
3. Mobile Crane (Hydra 12MT)

1. Goliath Crane: The goliath crane are used to transfer raw materials from raw yard to different machines such as CNC ,plate shearing, stamping, band saw, power press punching and universal punching and cutting machine etc. It is also used to transfer finish good from dispatch yard to different transport vehicles like truck, containers etc. In existing system of goliath crane cable trolley is used to supply current from main panel to goliath crane panel or motors. The installation of goliath crane in raw yard and dispatch yard (steel yard) and 10 sq.mm cable 4 core 60m length is mounted on cable trolley if goliath crane is major breakdown then high production loss occurs.

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Fig. 1.1

2. EOT Crane: The installation of EOT crane in fabrication and galvanizing shop to transfer raw materials, semi-finish and finish products from one machine to another machine.

3. Mobile Crane: It is used in raw yard and steel yard to transfer raw materials,finish good from one place to another.

II Plant Layout Details: .

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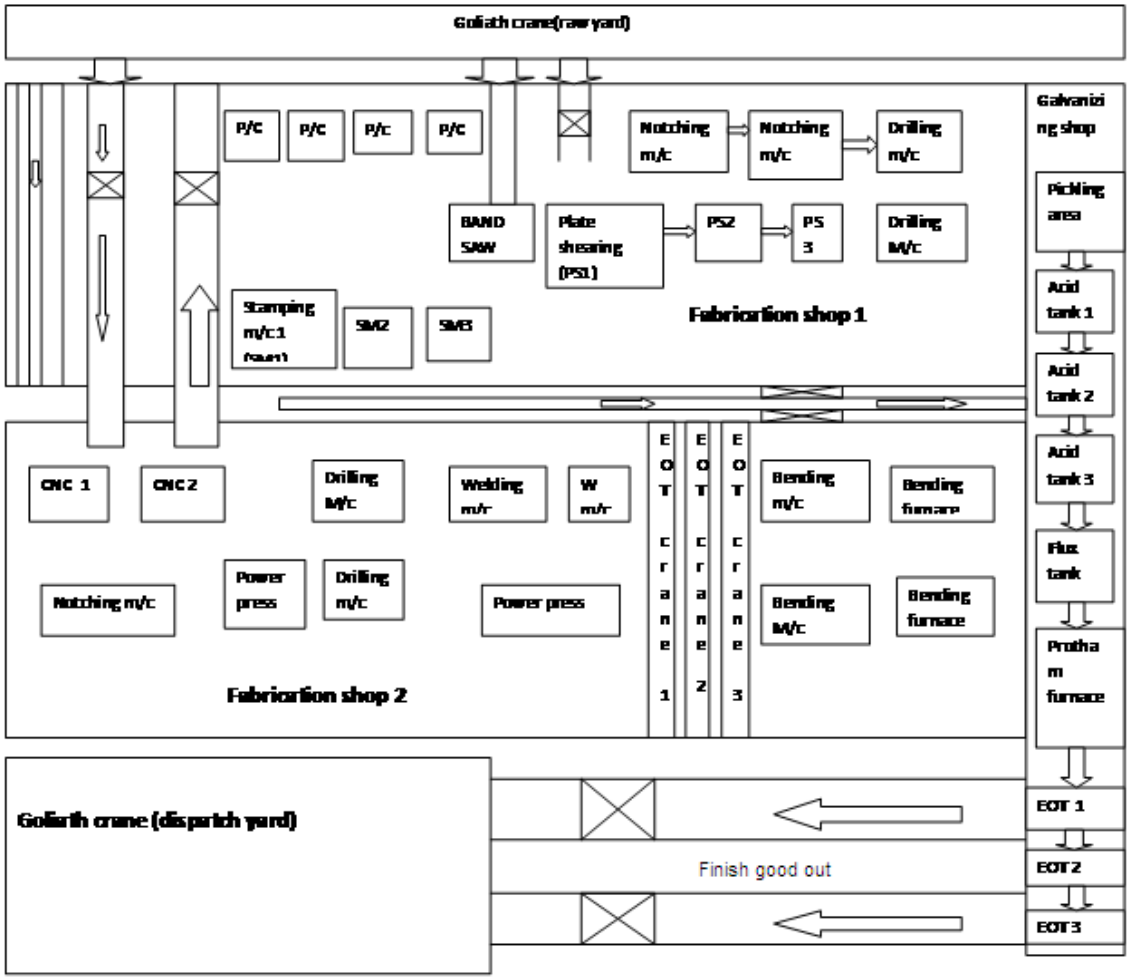

Fig.1.2.

1. Raw material section (raw yard)

Goliath crane is used for shifting raw materials from raw yard to different machine in fabrication shops.

2. Fabrication section:

Different machining operations are performed on raw materials and it is converted into semi-finish good.

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3. Galvanizing section:

The semi-finish good are converted to finish products by galvanizing furnace. (Protherm furnace)

4. Dispatch section: (dispatch yard)

Goliath crane are used to shift finished product from dispatch yard to different transportation of vehicles like container, trailor, truck etc

III. Flaws in current system:

1. Breakdown in existing system

Due to number of revolution goliath crane cable trolley, cable is stretch and crane break down occur due to disturbances of current supply or damages of cable. Every two years, cable was replaced due to damages of cable or high break down occurs in goliath crane. The cost of cable (10sq-mm 4 core) is one lakh rupees. When new cable is fitted then break down of crane is minimum for next six months. After six months breakdown is increased in every month and high production loss occurs.

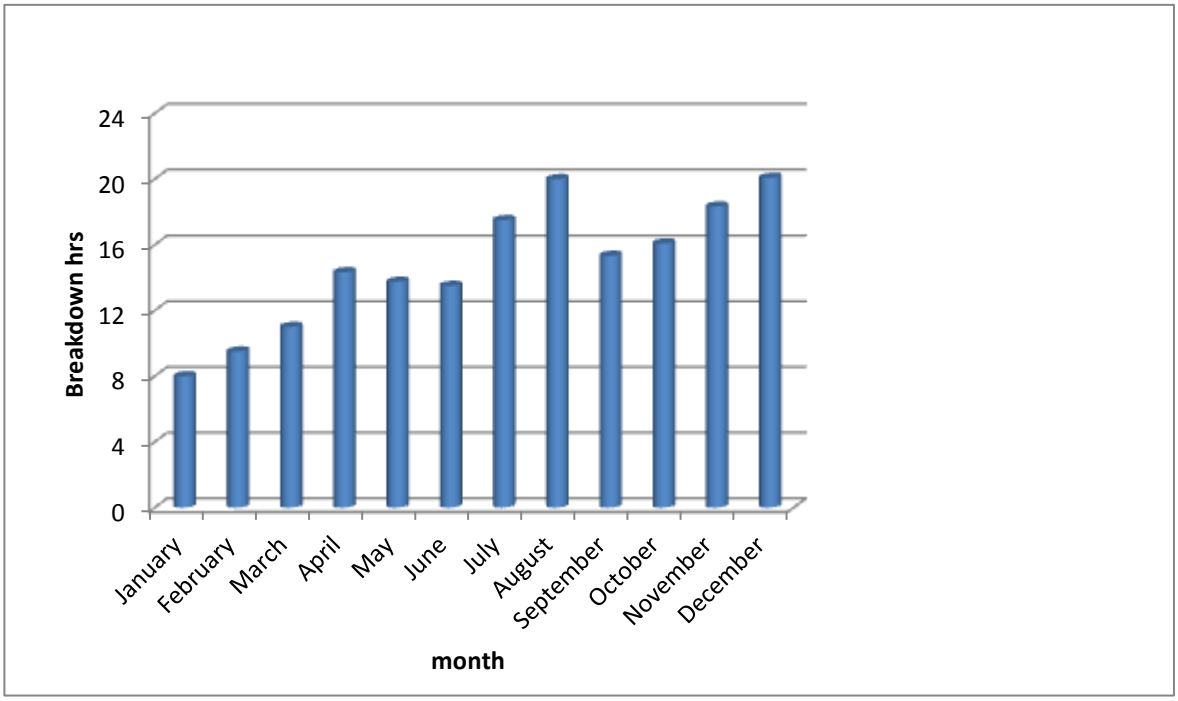

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Fig1.3.shows monthly breakdown in goliath crane (2008 years)

2. Effect on production rate:

Suppose an example of associated transmission tower manufacturing company, plant capacity – 100MT in 24 hours and net working hours is 22hr.

Production per hour = Plant capacity / Net working hours

= 100/22

= 4.55 tone /hour

This example shows that if goliath crane breakdown in 01hr from 3 shifts then 4.55 tone production loss in one day. Fig-1.3 shows if goliath crane is major breakdown then production loss is also high, it is calculated by 2008 year breakdown of goliath crane.

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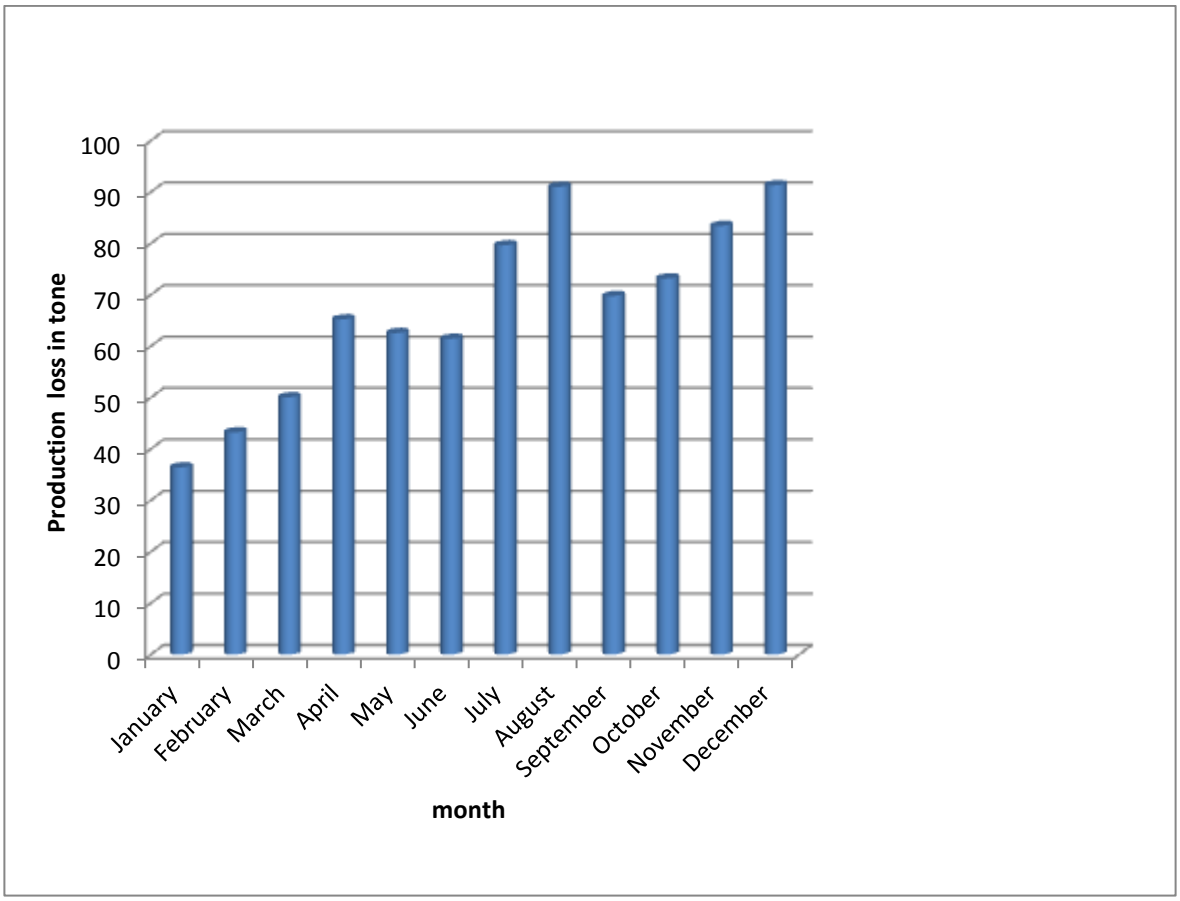

Fig-1.4 shows production loss in tone (2008 year)

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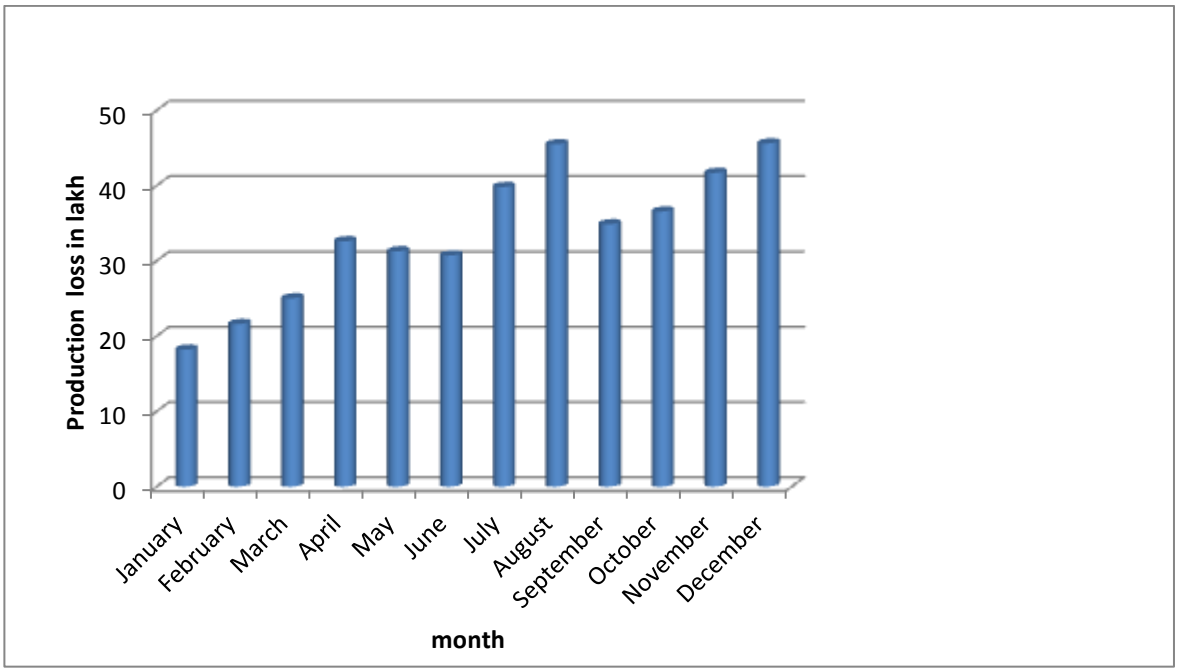

Fig. 1.5 production loss in lakh (2008)

It is assumed that production cost is 50,000 rupees for one tone production. Fig 1.3, 1.4 and 1.5 is calculated by goliath crane breakdown in year 2008.

III. Clue to design task:

By implementing of existing system new supply current bus-bar system will be applied on goliath crane, the breakdown is negligible and improvement in production system. Bus-bar is used to supply 3-phase current to different motors of goliath crane instead of cable trolley supply current system.

IV. Alternative design:

1. System design through bus-bar:

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Bus-bar systems for overhead travelling cranes are designed to ensure efficient, flexible and rapid mounting of components at any site. Mounting height can be mechanically and electrically connected to the bus bar system. The supply current to bus-bar is done normally through incoming terminal box. This allows both feeding and protection of the bus-bar system simultaneously. These easy to maintain bus-bar systems have enough flexibility for system extension. The bus-bar system can suitably work in numerous environments. Following are the components used in bus-bar system.

1. L-Type angle section size- 60x60x5mm

2. C-Channel section size- 50x100x8mm

3. Insulator

4. Current collector

5. Cable 4sq-mm 4 core.

Fig.1.6 Bus-bar system

V. System design through RCM:

Reliability centered maintenance (RCM) is a new strategic framework for ensuring that any asset continues to perform, as its users want it to perform. RCM process entails asking seven questions about each of the selected assets. It makes use of two documents namely, RCM information work sheet and RCM decision worksheet. RCM

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concept developed by the U.S. commercial airlines industry has been successes fully implemented by military, Navy, Nuclear power plants, Electric power generation and distribution undertakings and several other sectors. The fact that people has enthusiastically received RCM at all level and has enabled users to achieve some remarkable successes in all of these countries. This approach if implemented in totally will increase the production cost to a large degree and make production uneconomical.RCM approach is a compromise between PDM and BDM approach for optimizing the cost and ensuring the availability of machine.

RCM approach has been applied to the goliath crane system of transmission tower industry for research work reported in this paper.RCM methodology can be applied to Indian industry for reduction of breakdowns as well as optimization of preventive maintenance cost.

Reliability-centered maintenance, often known as *RCM*, is an industrial improvement approach focused on identifying and establishing the operational, maintenance, and capital improvement policies that will manage the risks of equipment failure most effectively. It is defined by the technical standard SAE JA1011, Evaluation Criteria for RCM Processes, which specifies that RCM address, at a minimum, the seven questions:

1. What is the item supposed to do and its associated performance standards?
2. In what ways can it fail to provide the required functions?
3. What are the events that cause each failure?
4. What happens when each failure occurs?
5. In what way does each failure matter?
6. What systematic task can be performed proactively to prevent, or to diminish to a satisfactory degree, the consequences of the failure?
7. What must be done if a suitable preventive task cannot be found?

VI. Identification and formulation of proposed work

Analysis of machine break down and shut down list for span of about 1 year has revealed that most of the failure, which have occurred, are due to failure of Goliath crane wheel and damages of cable 10mm sq. hence, it has been decided to focus attention on maintenance aspect of Goliath Crane system.

VII. Approach

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RCM concept has been applied to Goliath Crane system as illustrated herein. Goliath crane system has been categorise into three sub system.

- Power transmission sub system
- Guiding and transportation sub system and
- hydraulic sub system

VIII. The pay – back analysis:

This method means that the pay – off period is calculated .In its simplest version, Basic investment (B) is put against average annual yield (Y) , i.e., the difference between cash inflow and outflow . The pay off period (T) thus is the time it takes for B to be paid off.

T (years) = B (SEK)/ Y (SEK) --------- (I)

Example:-

It is propose that a tower manufacturing industry is thinking of changing existing supply current cable trolley system for goliath crane because it is found that high breakdown and production loss .A study of delays show that company wants to minimize breakdown and improvement in production by implementing supply current bus-bar system in goliath crane .

Basic investment (B)	**SEK**
Purchase price after discount	1,00,000
Training (01 operator @ SEK 5000	5,000
Installation	20,000
Miscellaneous	1,00,000
***T*otal**	**B = 2,25,000**

Cash Inflow (I)

1cable trolley operator @ SEK	48,000
10sq-mm cable 4 core	50,000
Maintenance and repair including cost	2,00,000
Of down time	----------

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Total	***2,98,000***

Cash outflow (O), SEK / Year

Operating costs	
(1) Fixed: One operator @ SEK	60,000
Insurance	5,000
(2) Variable:	
Replacement of parts	30,000
Maintenance & repairs	
Including cost of downtime	30,000
Miscellaneous	10,000
Total	***1, 35,000***

Results:-

I. Pay-back method:-

The pay of period (T) is calculated according to T=B/Y. The yield (Y) equals the annual cash inflow less the cash out flow (I - O).

T=22.5/29.8-13.5

=1.38 ≈ **1.5 Years.**

It indicates that the Investment is profitable after **1.5 years**.

Conclusion:

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High breakdown in existing goliath crane involved low production rate by implementing bus-bar system in goliath crane shows minimize breakdown and high production rate. It also indicates that the investment of new system is profitable after 1.5 years which is proved through pay-back analysis. By improving arrangement of transmission system, guiding and transportation system, hydraulic system through RCM approach for reducing breakdown and to improve availability of asset which will be proved in the next development.

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